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(54) **Syringe barrel and hypodermic needle assembly.**

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Description

The present invention relates to a syrigne barrel and hypodermic needle assembly, and an assembly of syringe barrels. More particularly, the present invention relates to a syringe barrel and hypodermic needle assembly wherein the hypodermic needle assembly contains a rearwardly facing cannula capable of piercing a barrier within the syringe barrel and to an assembly of a plurality of syringe barrels and integral web portions.

Generally speaking, a hypodermic syringe consists of a cylindrical barrel, most commonly made of plastic or glass, with a distal end adapted to be connectec to a hypodermic needle and a proximal end adapted to receive a stopper and plunger rod assembly. One of the purposes of the stopper is to provide a relatively air-tight seal between itself and the syringe barrel so that movement of the stopper up and down the barrel will cause liquid, blood or other fluids to be drawn into or forced out of the syringe through the distal end. The stopper is moved along the syringe barrel by applying axial force to a rigid plunger rod which is connected to the stopper and is sufficiently long to be accessible outside of the barrel. An example of a rigid barrel syringe is illustrated in US-A 4 430 080.

Also known to the art are hypodermic syringes having a flexible barrel portion, usually made of thermoplastic material, with a distal end adapted to be connected to a hypodermic needle. With a hypodermic needle attached, the user of a flexible barrel hypodermic syringe assembly may expel the medication by manually squeezing the flexible barrel portion forcing the medication through the hypodermic needle cannula and into the patient. A hypodermic syringe unit having a flexible barrel portion is illustrated in US-A 2 680 440.

A wide variety of injectable medications, or medications which can be rendered into injectable form by the addition of a diluent, are prefilled in rigid and flexible syringe barrel assemblies by pharaceutical manufacturers, contact packagers, and the like. The medication containing syringes often sit many weeks or months before administration of medication to the patient. Under these circumstances, it is desirable to isolate the medication from the environment as thoroughly as possible. This task is more easily accomplished at the proximal end of the syringe where, in the case of a rigid syringe, a resilient rubber stopper can effectively seal the barrel. In the case of a flexible barrel syringe, the proximal end may be sealed shut, for example, by heat sealing, after the syringe is filled with medication. At the distal end of the syringe barrel the problem of isolating the medication from the environment is more difficult to solve. In rigid barrel syringes, it is common practice to seal the tip at the distal end of the syringe with elastomeric tip caps as described in US-A 4 440 310 wherein the tip cap is removed at the time of use and a hypodermic needle assembly is placed over the syringe tip. In a rigid barrel syringe, the medication may also be isolated by placing an additional stopper in the syringe barrel so that the medication is contained between two resilient stoppers. When a stopper is used to provide needle isolation, additional structure in the syringe barrel is necessary to allow fluid to bypass the distal-most stopper. An example of this structure is illustrated in US-A 3 330 282.

In prefilled flexible barrel syringes, needle isolation may be accomplished by occluding the lumen of the cannula with a removable plug as illustrated in the above-mentioned US-A 2 680 440. Also, needle isolation may be accomplished by providing a barrier between the medication and the syringe tip, and a hypodermic needle having a dual pointed cannula. At the time of use, the hypodermic needle may be moved in a rearward direction so that the rearmost cannula pierces the barrier estastablishing fluid communication between the chamber contining the medication and the hypodermic cannula. Such a syringe is illustrated in US-A 4 018 222. A pierceable barrier design along the lines taught by US-A 4 018 222 is advantageous with respect to its ability to isolate the medication from the environment, however, it has deficiencies in that the two-pointed cannula may be inadvertently activated by pressure on the needle shield which forces the cannula through the barrier.

Problems also exist in prefilling rigid or flexible syringe barrel. When filling, for example, thousands of syringe barrels, each of these syringe barrels must be delivered to a filling station, filled and then sealed. If the filling station contains multiple filling nozzles all of the syringe barrels in the area must be spaced appropriately so that each is in the proper position with respect to the filling nozzles, and then the syringe barrels are moved as a group to a sealing station which provides for sealing of the proximal ends of the barrels. A rigid barrel syringe may be sealed via introduction of a stopper into the barrel and a flexible barrel syringe may be sealed by compressing the proximal end of the barrel shut and applying heat energy to seal this end shut. One method of accomplishing multiple unit filling and sealing is to place the syringe barrels in a fixture which holds the syringe barrels at a predetermined distance from each other so that all the barrels in the fixture will be properly aligned with the filling station nozzles and, also, the subsequent sealing operation may be performed with the syringe barrels properly positioned. At the end of the operation the individual syringe barrels must be removed from the fixture so that the fixture may be returned and used again. This is a tedious operation requiring care to avoid contamination of the fixtures by spilled medication.

Rigid and flexible barrel syringe assemblies for use with prefilled medication, having structure for isolation of the medication from the environment, and methods of prefilling have been addressed by the prior art, as alluded to above. However, there is still a need for simple, straightforward, reliable, easily fabricatecd syringe assemblies for the storage and administration of medications.

It is the object of the present invention to provide a syringe barrel and hypodermic needle assembly which effectively isolates the hypodermic needle

cannula from the medication and which could be easily activated while being difficult to activate inadvertently.

This problem is solved, according to the invention, with the features contained in claim 1.

An operable syringe barrel and hypodermic needle assembly of the present invention includes a barrel portion having a chamber for retaining fluid and a tip portion extending from a distal end of the barrel portion having a passageway therethrough. A projection extends radially outwardly from the tip portion. Pierceable barrier means is provided for preventing fluid communication between the chamber and the passageway. A hub having a forward end, a rearward end and a conduit therethrough is movably positioned within the passageway. A first cannula extens outwardly from the forward end of the hub and a second cannula extends outwardly from the rearward end of the hub wherein the first cannula and the second cannula are in fluid communication with each other. A needle shield removably engages the tip, covering the first cannula. This needle shield includes an outer extension portion extending over a portion of the tip wherein the outer extension portion is capable of contacting the projection for limiting the motion of the needle shield toward the proximal end of the barrel. The outer extension portion includes a longitudinal groove which is wider than the projection and capable of receiving the projection. The needle shield also includes an inner extension portion projecting proximally into the passageway and capable of contacting the hub. The inner extension portion is long enough so that when the needle shield is rotated to align the groove and projection, and moved in a proximal direction with respect to the tip portion so that the projection enters the groove, the inner extension pushes against the hub and moves the hub in a proximal direction causing the second cannula to pierce the piercable barrier means.

In accordance with another embodiment of the present invention, an operable syringe barrel and hypodermic needle assembly includes an elongate barrel portion having an open proximal end and a chamber for retaining fluid. A tip portion extends from a distal end of the barrel portion and includes a passageway therethrough. A plainer web extends radially outwardly from the tip portion and is substantially parallel to the longitudinal axis of the tip portion. A piercable barrier extends across the passageway for preventing fluid communication between the chamber and the passageway. A rigid hub having a forward end, a rearward end and a conduit therethrough is movably positioned within the passageway. A first cannula extends outwardly from the forward end of the hub and a second cannula extends outwardly from the hub wherein the first cannula and the second cannula are in fluid communication with each other. An elongate hollow needle shield slidably engages the tip covering the first cannula. This needle shield has an outer skirt portion extending over a portion of the tip. The outer skirt portion is capable of contacting the web for limiting the motion of the needle shield toward the proximal end of the barrel. The outer skirt portion includes a longitudinal groove being wider than the web and capable of receiving the web. Teh needle shield includes an inner skirt portion projecting proximally into the passageway and capable of contacting the hub. The inner skirt portion is long enough so that when the needle shield is rotated to align the groove in the web, and moved in a proximal direction with respect to the tip portion so that the web enters the groove, the inner skirt pushes against the hub and moves the hub in a proximal direction causing the second cannula to pierce the piercable barrier.

In accordance with the pricinples of the present invention, a number of advantages and objectives are attained. The present invention provides a simple straightforward, reliable, easily fabricated syringe barrel and hypodermic needle assembly for the storage and administration of medication, wherein the structure of the syringe barrel and hypodermic needle assembly effectively isolates the hypodermic needle cannula from the medication before the time of use while the syringe barrel and hypodermic needle assembly is easily activated intentionally while being difficult to activate inadvertently.

Fig. 1 is a perspective view of the syringe barrel and hypodermic needle assembly of the present invention;

Fig. 2 is an exploded perspective view of the components of the syringe barrel and hypodermic needle assembly of Fig. 1;

Fig. 3 is a top plan view of the syringe barrel and hypodermic needle assembly of Fig. 1;

Fig. 4 is a side elevation view of the syringe barrel and hypodermic needle assembly of Fig. 1 shown with the proximal end of the barrel portion sealed;

Fig. 5 is a partial enlarged cross-sectional view of the syringe barrel and hypodermic needle assembly of Fig. 3 taken along lines 5-5;

Fig. 6 is an enlarged partial cross-sectional view, similar to the cross-sectional view of Fig. 5, showing the second cannula piercing the barrier to establish fluid communication between the hypodermic needle assembly and the chamber;

Fig. 7 is a perspective view illustrating the expulsion of medication from the syringe barrel using digital force;

Fig. 8 is a perspective view of another embodiment of the present syringe barrel and hypodermic needle assembly wherein the barrel portion is rigid;

Fig. 9 is a perspective view of the syringe barrel and hypodermic needle assembly of Fig. 8 illustrating the position of the needle shield when the needle assembly is in fluid communication with the chamber;

Fig. 10 is a perspective view of the syringe barrel and hypodermic needle assembly of Fig. 9 with the needle shield removed;

Fig. 11 is a perspective view of the syringe barrel assembly of the present invention;

Fig. 12 is a perspective view of the syringe barrel assembly of the present invention with needle shields attached;

Fig. 13 is a side elevation view of a plurality of syringe barrel assemblies nested together in rows;

Fig. 14 is a top plan view of the plurality of syringe barrel assemblies of Fig. 13; and

Fig. 15 is a perspective view of another embodiment of the syringe barrel assembly of the present invention wherein the barrel portions are rigid.

While the invention is satisfied by embodiments in many different forms, there is shown in the drawings and will herein be described in detail preferred embodiments of the invention with the understanding that the present disclosure is to be considered as exemplary of the principles of the invention and is not intended to limit the invention to the embodiments illustrated. The scope of the invention will be measured by the appended claims and their equivalents.

Adverting to Figs. 1–7, an operable syringe barrel and hypodermic needle assembly 20 includes an elongate barrel portion 21 having a chamber 22 for retaining fluid. A tip portion 23 extends from distal end 25 of the barrel portion and includes passageway 26. For purposes of the description of the present invention, the term "distal end" is intended to refer to the end furthest from the person holding the syringe, whereas the term "proximal end" is meant to refer to the end closest to the holder of the syringe.

A planar web 27 extends radially outwardly from the tip portion. A second planar web 28 extends radially outwardly from the tip portion and is oppositely disposed from planar web 27. These webs are substantially parallel to longitudinal axis 29 of the tip portion. A pierceable barrier 31 extends across passageway 26 for preventing fluid communication between chamber 22 and the passageway. In this preferred embodiment, the pierceable barrier is integrally formed partition of the same material as the tip portion and barrel portion. However, it is within the purview of the instant invention to include a pierceable barrier structure made of different material which is attached to the barrel portion and/or the tip portion via adhesive bonding, ultrasonic welding or other suitable means and that the integral barrier illustrated is exemplary of these many possibilities.

A needle assembly 32 includes a rigid hub 34 having a forward end 35 and a rearward end 37 and a hub passageway or conduit 38 therethrough. Hub 34 is movably positioned within passageway 26. A first cannula 39, having a lumen 40 therethrough, extends outwardly from the forward end of the hub terminating in a sharpened tip 41 adapted to penetrate human flesh. A second cannula 43 having a lumen (not shown) therethrough extends outwardly from rearward end 37 of the hub and terminates in a sharpened tip 44 adapted to penetrate pierceable barrier 31 to establish fluid communication between chamber 22 and the second cannula. In the preferred embodiment as best illustrated in Fig. 5, the first cannula and the second cannula are made of one piece construction and held in position with respect to the hub via adhesive 45, such as epoxy, UV curable adhesive, heat curable adhesive and the like. It is within the purview of the present invention to inlcude separate cannula wherein the lumens of the separate cannula are joined by the hub passageway or conduit in the hub to form a continuous fluid path from the tip of the second cannula to the tip of the first cannula. It is also within the purview of the instant invention to include a hub wherein the second cannula is integrally molded from the hub material and not a separate component. The one-piece cannula structure of the preferred embodiment is exemplary of these many structural possibilities wherein the first cannula and the second cannula are in fluid communication.

An elongate hollow shield 46 slidably engages tip portion 23 while covering first cannula 39. The needle shield includes an outer extension or outer skirt portion 47 extending over a portion of the tip. The outer extension or outer skirt portion includes intermediate surface 49 which contacts web 27 for limiting the motion of the needle shield toward the proximal end of the barrel. Outer extension or outer skirt portion 47 also includes longitudinal groove 50 which is wider than web 27 and capable of receiving web 27 when the needle shield is rotated so that web 27 and groove 50 are aligned. When web 27 and groove 50 are aligned, the needle shield is capable of moving toward the proximal end of the syringe barrel without being obstructed by the structure of the outer skirt portion, so long as web 27 does not contact base 51 of the groove.

Needle shield 46 also includes an inner projection or inner skirt 52 projecting downwardly in a proximal direction into passageway 26 and capable of contacting hub 34, preferably at forward end 35 of the hub. Inner skirt portion 52 is long enough so that when the needle shield is rotated to align groove 50 with web 27 and the needle shield is moved in a proximal direction with respect to the tip portion, web 27 enters groove 50 while inner skirt 52 pushes against the hub and moves the hub in a proximal direction causing second cannula to pierce the pierceable barrier, establishing fluid communication between the chamber and the second cannula, as best illustrated in Fig. 6. The structure of the instant invention which requires the deliberate act of rotating the needle shield to align groove 50 and web 27 helps overcome a major deficiency of the prior art which is inadvertent activation of the syringe by applying force to the needle shield. With the instant invention inadvertent force applied to the needle shield along its longitudinal axis will not cause second cannula to pierce the barrier unless the needle shield is deliberately oriented to align the groove and the web.

It should be noted that inner skirt portion 52 is preferably, but not necessarily, circularly shaped having a substantially circularly shaped cross section. The inner skirt portion is a projection and may assume a variety of shapes, such as rod-shaped, so long as the projection has the structural integrity necessary to move the needle assembly, and force the second cannula through the pierceable barrier. Further, the shape of outer skirt portion is preferably, but not necessarily, circularly shaped having a substantially circularly shaped cross section. The circular shape of the outer skirt portion is desirable because it provides a rounded knob-like surface

for the user to hold the needle shield for the purpose of rotating it or moving it in a longitudinal direction.

It should also be noted that the planar shape of web 27 is the preferred shape of the structure which interacts with groove 50 in the needle shield. However, other projection structures such as a pin or a cantilever member projecting radially outwardly from the tip are also suitable, and within the purview of the present invention. It is also within the purview of the instant invention to include a barrel portion with more than one projection or planar web, and a needle shield with one or more grooves and that the number of grooves does not necessarily have to equal the number of webs so long as one web portion engages one groove to allow movement of the needle shield in a distal direction. It may be desirable to extend the outer skirt portion for more than 180 degrees and to include two web portions on the syringe barrel and two grooves in the outer skirt portion of the needle shield.

This preferred embodiment also includes retention means for holding the needle shield in the predetermined angular position with respect to the tip portion, before use. The retention means preferably includes a weld portion 55 wherein a small portion of the outer skirt is attached to the outer surface of the tip through the application of heat energy, ultrasonic energy, adhesive or other suitable means. The weld portion holds the needle shield in a position which can be changed only by applying a rotational force to the needle shield, with respect to the barrel, which will shear the weld portion at the interface between the needle shield and the syringe barrel. The weld portion provides additional help to overcome a deficiency of the prior art in that it helps prevent the inadvertent activation of the syringe by increasing the force required to align the web portion on the tip and the groove in the needle shield. This weld portion also provides tamper evidence, warning the user of potential contamination of syringe barrel assemblies wherein the weld is broken. An alternative positioning means can include a suitable film or paper (not shown) adhesively attached to the outer skirt portion and the syringe barrel or tip so that forced rotation of the needle shield will cause the paper to shear and rip along the interface between the needle shield and the syringe barrel or tip, again helping to prevent inadvertent activation and providing tamper evidence for the user.

Tip portion 23 also includes a first protuberance 56 projecting radially inwardly into passageway 26. Protuberance 56 is shaped to allow the hub to pass thereover when manual force is applied to the hub through the needle shield. A second protuberance 57 is positioned distally with respect to the first protuberance and projects radially inwardly into the passageway. This second protuberance is shaped to prevent the hub from coming out of the passageway when the needle shield is removed and the syringe is used for mixing the medication and/or for injecting medication. As best illustrated in Fig. 5, a portion of the hub of needle assembly 32 can be placed between protuberances 56 and 57 to hold the hub in a predetermined, desirable, position along the passageway, before use, wherein the second cannula preferably does not contact the pierceable barrier. During use, the hub may be forced over the first protuberance so that the second cannula may pierce the pierceable barrier. Also, in this preferred embodiment the outside diameter of the inner skirt portion is slightly larger than the inside diameter of the passageway at the position of the second protuberance so that there is a frictional interference fit which helps prevent the unintential removal of the needle shield by requiring an applied force to move the needle shield with respect to the tip portion.

The steps required for placing medication in elongate barrel 21 and sealing its flexible proximal end will be discussed in more detail hereinafter. After the barrel is filled with medication and sealed, the medication is isolated from the environment until the user causes the second cannula to pierce the pierceable barrier and establishes fluid communication between the chamber and the needle assembly. At this point, the syringe barrel and hypodermic needle assembly is ready to use for administering an injection wherein the medication may be forced out of the syringe barrel using digital pressure as illustrated in Fig. 7. If the syringe contains a dry medication in powder or lyphilized form, the diluent usually contained in a vial with a piercable stopper, will have to be mixed with the powdered medication before administration of the injection. To do this, the syringe and barrel assembly is activated, the first cannula is inserted into a source of diluent and the barrel is digitally depressed to substantially remove the air contained therein, where upon the removal of the digital pressure will draw the diluent into the syringe barrel for mixing. At this point, the first cannula is removed from the vial and the injection may be administered.

Figs. 8-10 illustrate an alternative embodiment of the syringe barrel and hypodermic needle assembly of the present invention further including a plunger rod and stopper assembly. In this alternative embodiment the structure at the distal end of the barrel including the needle shield, the needle assembly and the tip portion of the barrel are substantially identical to the embodiments of Figs. 1-7. Accordingly, substantially similar components performing substantially similar functions will be numbered identically to those components in the embodiment of Figs. 1-7, except that a suffix "a" will be used to identify these components in Figs. 8-10. An operable syringe barrel and hypodermic needle assembly 59 includes a barrel portion 61 having a chamber 62 for retaining fluid and a tip portion 23a having a passageway 26a therethrough. A planar web 27a extends radially outwardly from said tip portion wherein the web is substantially parallel to the longitudinal axis of the tip portion. A pierceable barrier (not shown) extends across the passageway for preventing fluid communication between the chamber and the passageway. A rigid hub (not shown) is slidably positioned within passageway 26a. A first cannula 39a extends outwardly from the forward end of the hub and a second cannula (not shown) extends

outwardly from the rearward end of the hub wherein the first and the second cannula are in fluid communication.

A needle shield 46a slidably engages tip portion 23a. Needle shield 46a includes outer skirt portion 47a extending over a portion of the tip. The outer skirt portion is capable of contacting planar web portion 27a for limiting the motion of the needle shield toward the proximal end of the barrel. The outer skirt portion also includes longitudinal groove 50a which is wider than web 27a and capable of receiving web 27a. The needle shield also includes an inner skirt portion (not shown) projecting proximally into the passageway and capable of contacting the hub. This inner skirt portion is long enough so that when the needle shield is rotated to align groove 50a with web 27a, and moved in a proximal direction with respect to the tip portion so that the web enters the groove, the inner skirt will push against the hub and move the hub in a proximal direction causing the second cannula (not shown) to pierce the pierceable barrier (not shown) establishing fluid communication between the interior of the syringe barrel and the second cannula.

In this alternative embodiment the portion of elongate barrel portion 61 defining the chamber is rigid and has the substantially circularly shaped cross section. In addition to the syringe barrel and hypodermic needle assembly, a quantity of liquid medication 64 is placed in chamber 62. A stopper 65 is slidably positioned in fluid-tight engagement inside barrel portion 61. A rigid plunger rod 67 engages stopper 65 and extends outwardly from proximal end 68 of the barrel portion. The plunger rod is accessible outside the barrel portion so that force can be applied to the plunger rod to move the stopper within the barrel to force medication through the needle assembly during the injection process.

Referring now to Figs. 11-14, another aspect of the present invention includes a syringe barrel assembly 70 having a plurality of syringe barrels 71 each including a barrel portion 73 having a chamber 74 for retaining fluid. A tip portion 75 extends from distal end 76 of the barrel portion having a passageway 77 therethrough. the passageway is adapted to accept the hub and second cannula of a hypodermic needle assembly having a hub, a first cannula extending outwardly from a distan end of said hub and a second cannula extending outwardly from a proximal end of said feel whereas said cannulae arre in fluid communication. A pierceable barrier (not shown) is positioned in passageway 77 for preventing fluid communication between chamber 74 and the passageway. A plurality of planar shaped web portions 72 extend radially outwardly from the tip portions connecting the syringe barrels. It is preferred that the web portions are substantially parallel to the longitudinal axis of the tip portions. The web portions are integrally formed of the same material as the syringe barrels. The web portions and the syringe barrels are connected so that the barrels are spaced apart along a substantially straight line wherein the longitudinal axes of said syringe barrels are substantially parallel to each other. It is preferred, but not necessary, that the barrels be equally spaced from each other along the web portions.

The syringe barrel assembly contains syringe barrels which are ready for sterilization, filling and sealing. The filling operation, which will be explained in more detail hereinafter, can be performed by delivering medication through open proximal end 79 of the syringe barrel and then sealing the barrel shut by compressing the open proximal end and applying heat energy or heat producing energy or by other suitable means. Tip portion 75 of the syringe barrels is substantially identical to the tip portion in the embodiment of Figs. 1-7. The syringe barrels are substantially identical to needle shield 46 in the embodiments of Figs. 1-7 to show that a needle assembly and needle shield may be attached to the syringe barrels before filling or after filling. In filling syringe barrels, in general, it is common practice to place a number of syringe barrels in a fixture which aligns the syringe barrels and spaces them apart in a predetermined manner so that the group of syringes may be filled in a multiple head filling device wherein a plurality of nozzles deliver liquid or solid medication into a plurality of open-ended syringe barrels aligned therewith. Also, the syringe barrels, when in the fixture, may be indexed through a filling station, one at a time or a row at a time, until all barrels are filled. In some cases, the next step may be subjecting the filled syringe barrels to a lyophilization procedure to remove water from the medication. The last step is to individually, or in a group, seal the proximal end of the syringe barrel from the environment.

The instant invention offers the advantage of providing a plurality of syringe barrels and integral web portions holding the syringe barrels in a relative position with respect to each other so that is may not be necessary to use specific fixtures or dies to carry the syringe barrels through a filling and sealing process because the web portions act as a fixture holding the syringe barrels in a predetermined spaced relationship. In an automated filling and sealing operation, the syringe barrels can be indexed through the filling and sealing stations relying on the web material to hold the relative position of the syringe barrels. Also, the present invention allows the grouping of a plurality of syringe barrels as best illustrated in Figs. 13 and 14. Here the assemblies are nested together in rows so that the individual barrels in alternate rows are in approximate alignment with each other forming orthogonal rows and columns of syringe barrels in the alternate rows. It is preferred that the groups of nested syringe barrel assemblies be mechanically held together in their relative positions so that they may be, preferably, filled and sealed in a group. One possible method of holding the plurality of syringe barrel assemblies together is the use of known plastic shrink wrap material 81. This material will hold the syringe barrel assemblies together through the filling and sealing operation and can be cut or torn away after the syringes are filled with medication.

The instant invention offers the further advantage that a syringe barrel manufacturer can produce large quantities of syringe barrel assemblies

in accordance with the present invention, shrink wrap groups of syringe barrel assemblies together, place the assemblies in a bacteria impervious package which will exclude bacteria from the contents, and sterilize said package and its contents. This sterile package of nested syringe barrel assemblies may then be sold to pharmaceutical manufacturers or hospitals for filling with medication and sealing. It will be apparent to one skilled in the art that there are many possibilities for placing syringe barrels along webs in equal or unequal spacing positions and for joining adjacent rows of syringe barrel assemblies so that they nest or rest in some other tangential relationship with each other and that the equally spaced syringe barrels nested as illustrated in Fig. 14, is exemplary of these many possibilities. It is also within the purview of the present invention to include substantially long web syringe barrel assembly, containing perhaps several hundred syringe barrels, wherein the web and syringe barrel assemblies are rolled in coils for feeding into filling and sealing devices along a straight line.

Adverting to Fig. 15, in another embodiment of the present invention, a syringe barrel assembly 85 includes a plurality of thermoplastic syringe barrels 86 each including a rigid cylindrical barrel portion 87 having an open proximal end 88 and a chamber 89 for retaining fluid. A tip portion 91 extends from distal end 92 of the barrel portion and includes a passageway 93 therethrough. Piercable barrier means is provided for sealing each of the passageways so that fluid cannot leave the chamber therethrough. In this embodiment a pierceable barrier (not shown) is positioned in each of the passageways. The barrier may be pierced by a dual pointed needle assembly as taught hereinabove. A plurality of web portions 94 between the syringe barrels connects the syringe barrels. The web portions are integrally formed from the same thermoplastic material as the syringe barrels. The web portions and the syringe barrels are connected so that the syringe barrels are spaced apart from each other along a substantially straight line wherein the longitudinal axes of the syringe barrels are substantially parallel to each other. The syringe barrel assembly of the present embodiment may be used in conjunction with the dual cannula needle assembly and needle shield of Figs. 1-7 wherein this needle shield is shown in phantom lines and indicated as 46a in Fig. 15.

After filling the syringe barrels with medication and sealing the proximal end of the barrels, the barrels may be separated by shearing the web portion between adjacent barrels. The web portion may be sheared so that substantially most of it is discarded or partially removed, such as in the embodiments of Figs. 1-7 wherein the remaining portion of the web acts as a structure which interacts with the needle shield to help precent inadvertent piercing of the barrier. The web may be sheared in a press using spaced dies, or with a hot wire or other suitable means.

The syringe barrels of the present invention may be constructed of thermoplastic material such as polypropylene and polyethylene. For embodiments where the barrel portion and the proximal end of the barrel are flexible it will be necessary to form the syringe barrel of substantially thinner sections of material to provide the flexibility necessary. A wise variety of materials are suitable for the stopper with natural rubber and butyl rubber being preferred. A wide variety of rigid materials are suitable for the plunger rod with thermoplastic materials such as polypropylene, polyethylene and polystyrene being preferred. A wide variety of rigid materials are suitable for constructing the hub, for use in the needle assembly, with thermoplastic materials such as polypropylene and polyethylene being preferred. It is preferred that the first cannula and the second cannula be formed of medical grade stainless steel. However, it is possible to form the hub and the second cannula out of one-piece thermoplastic material such as ABS, polypropylene or polyethylene. It may also be desirable to apply a medical grade lubricant, such as medical grade silicone lubricant, to the outside of the first cannula to reduce the force required for the cannula to penetrate the patient's flesh. It is preferred that all elements of the syringe barrel and hypodermic needle assembly, and the syringe barrel assembly of the instant invention be sterile when used. Accordingly, materials should be selected for compatibility with the sterilization process being used.

Thus, it can be seen that the present invention provides a simple, straightforward, reliable, easily fabricated syringe barrel and hypodermic needle assembly for the storage and administration of medication, wherein the structure of the syringe barrel and hypodermic needle assembly effectively isolates the hypodermic needle cannula from the medication before the time of use and the syringe is easily activated intentionally while being difficult to activate inadvertently. Another aspect of the instant invention provides a syringe barrel assembly which holds and orients the syringe barrels with respect to each other in order to eliminate the need for additional fixturing during prefilling and sealing operations.

Claims

1. An operable syringe barrel and hypodermic needle assembly comprising:
a barrel portion (21; 61; 71; 87) having a chamber (22) for retaining fluid;
a tip portion (23) extending from said barrel portion and having a passageway (26) therethrough;
pierceable barrier means (31) for preventing fluid communication between said chamber (22) and said passageway (26);
a hub (34) having a forward end (35), a rearward end (37) and a conduit (38) therethrough, said hub being movably positioned within said passageway (26),
a first cannula (39) extending outwardly from said forward end of said hub (34, and a second cannula (43) extending outwardly from said rearward end of said hub, said first cannula and said second cannula being in a fluid communication;
a needle shield (46; 46a) slidably engaging said tip (23) and covering said first cannula (39),

said needle shield (46;46a) having a first skirt portion (52) projecting rearwardly into said passageway (26), said first skirt portion (52) being long enough so that when said needle shield is moved in forward direction with respect to said tip portion (23), said inner skirt (52) pushes against said hub (34) and moves said hub toward said barrel portion (21) causing said second cannula (43) to pierce said pierceable barrier means (31), characterized in that
said tip portion (23) comprises a projection (27) extending radially outwardly from said tip portion (23),
said needle shield (46; 46a) comprises an outer second skirt portion (47) overlapping said tip portion (23) and being capable of contacting said projection (27) for limiting the motion of said needle shield (46;46a) toward said barrel portion (21) and preventing said second cannula (43) from piercing said barrier means (31), and
said second skirt portion (47) includes a longitudinal groove (50;50a) being capable of receiving said projection (27), when said needle shield (46) is rotated to a position wherein the projection is aligned with respect to the groove (50; 50a).

2. The syringe barrel and hypodermic needle assembly of claim 1 wherein said inner skirt portion (52) has a substantially circularly shaped cross section.

3. The syringe barrel and hypodermic needle assembly of claim 1 or 2 wherein said outer skirt portion (47) has a substantially circularly shaped cross section.

4. The syringe barrel and hypodermic needle assembly of one of claims 1-3 wherein said projection (27) is a planar web extending radially outwardly from said tip portion (23), said web being substantially parallel to the longitudinal axis of said tip portion.

5. The syringe barrel and hypodermic needle assembly of one of claims 1-4 wherein said tip portion (23) includes a second projection (28) oppositely disposed from said projection (27).

Patentansprüche

1. Betätigbare Anordnung aus einem Spritzenbehälter und einer Subkutankanüle, mit:
- einem Behälterabschnitt (21; 61; 71; 87) mit einer Kammer (22) zum Halten von Flüssigkeit;
- einem sich vom dem Behälterabschnitt erstreckenden Kopfstück (23), das einen durchgehenden Durchgang (26) aufweist;
- einer durchstechbaren Sperreinrichtung (31) zum Verhindern einer Fluidverbindung zwischen der Kammer (22) und dem Durchgang (26);
- einem Ansatz (34) mit einem vorderen Ende (35), einem hinteren Ende (37) und einem durch diesen gehenden Kanal (38), wobei der Ansatz beweglich in dem Durchgang (26) angeordnet ist;
- einer sich von dem vorderen Ende des Ansatzes (34) nach außen erstreckenden ersten Kanüle (39) und einer sich von dem hinteren Ende des Ansatzes (34) nach außen erstreckenden zweiten Kanüle (43), wobei die erste Kanüle und die zweite Kanüle in Fluidverbindung stehen;
- einem Nadelschutz (46; 46a), der gleitend mit dem Kopf (23) in Eingriff ist und die erste Kanüle (39) bedeckt;
- wobei der Nadelschutz (46; 46a) einen ersten Schürzenabschnitt (52) aufweist, der nach hinten in den Durchgang (26) vorsteht, wobei der erste Schürzenabschnitt (52) von derartiger Länge ist, daß, wenn der Nadelschutz in Vorwärtsrichtung relativ zum Kopfstück (23) bewegt wird, die innere Schürze (52) gegen den Ansatz (34) druckt und den Ansatz auf den Behälterabschnitt (21) zu bewegt, wodurch die durchstechbare Sperreinrichtung (31) von der zweiten Kanüle (43) durchstochen wird,
dadurch gekennzeichnet, daß
das Kopfstück (23) einen Vorsprung (27) aufweist, der sich von dem Kopfstück (23) radial nach außen erstreckt,
der Nadelschutz (46; 46a) einen äußeren zweiten Schürzenabschnitt (47) aufweist, welcher das Kopfstück (23) überlappt und welcher in der Lage ist, den Vorsprung (27) zur Begrenzung der Bewegung des Nadelschutzes (46; 46a) in Richtung auf den Behälterabschnitt (21) zu berühren und die zweite Kanüle (43) am Durchstechen der Sperreinrichtung (31) zu hindern und
der zweite Schürzenabschnitt (47) eine Längsnut (50, 50a) aufweist, die in der Lage ist, den Vorsprung (27) aufzunehmen, wenn der Nadelschutz (46) in eine Position gedreht wird, in welcher der Vorsprung zu der Nut (50; 50a) ausgerichtet ist.

2. Anordnung aus einem Spritzenbehälter und einer Subkutankanüle nach Anspruch 1, bei welcher der innere Schürzenabschnitt (52) einen im wesentlichen kreisförmigen Querschnitt aufweist.

3. Anordnung aus einem Spritzenbehälter und einer Subkutankanüle nach Anspruch 1 oder 2, bei welcher der äußere Schürzenabschnitt (47) einen im wesentlichen kreisförmigen Querschnitt aufweist.

4. Anordnung aus einem Spritzenbehälter und einer Subkutankanüle nach einem der Ansprüche 1 bis 3, bei welcher der Ansatz (27) eine planare Rippe ist, die sich von dem Kopfstück (23) radial nach außen erstreckt, wobei die Rippe im wesentlichen parallel zur Längsachse des Kopfstücks ist.

5. Anordnung aus einem Spritzenbehälter und einer Subkutankanüle nach einem der Ansprüche 1 bis 4, bei welcher das Kopfstück (23) einen zweiten Vorsprung (28) aufweist, der gegenüber dem Vorsprung (27) angeordnet ist.

Revendications

1. Un ensemble manœuvrable de corps de seringue et d'aiguille hypodermique comprenant
- une partie formant corps (21; 61; 71; 87) comportant une chambre (22) pour contenir un fluide,
- une partie formant embout (23) s'étendant à partir de ladite partie formant corps et munie d'un passage (26) au travers,
- des moyens formant barrière perforables (31) pour empêcher une communication fluidique entre ladite chambre (22) et ledit passage (26),
- un manchon (34), muni d'une extrémité avant

(35), d'une extrémité arrière (37) et d'un conduit traversant (38), ledit manchon étant monté de façon mobile dans ledit passage (26),

– une première chanule (39) s'étendant vers l'extérieur à partir de ladite extrémité avant dudit manchon (34), et une seconde canule (43) s'étendant vers l'extérieur à partir de ladite extrémité arrière dudit manchon, ladite première canule et ladite seconde canule étant en communication fluidique,

– un capuchon d'aiguille (46; 46a), en contact glissant avec ledit embout (23) et recouvrant ladite première canule (39), ledit capuchon d'aiguille (46, 46a) comprenant une première partie en forme de jupe (52) faisant saillie vers l'arrière dans ledit passage (26), ladite première partie en forme de jupe (52) étant d'une longueur suffisante pour que lors du déplacement dudit capuchon d'aiguille en direction de l'avant par rapport à ladite partie formant embout (23), ladite jupe intérieure (52) exerce une poussée contre ledit manchon (34) et déplacé ledit manchon vers ladite partie formant corps (21), ce qui provoque la perforation desdits moyens formant barrière perforable (31) par ladite seconde canule (43), caractérisé en ce que ladite partie formant embout (23) comprend une saillie (27) s'étendant radialement vers l'extérieur à partir de ladite partie formant embout (23), en ce que ledit capuchon d'aiguille (46; 46a) comprend une seconde partie formant jupe (47) recouvant ladite partie formant embout (23) et étant susceptible de venir en contact avec ladite saillie (27) pour limiter le déplacement dudit capuchon d'aiguille (46; 46a) vers ladite partie formant corps (21) et empêcher ladite seconde canule (43) de perforer lesdits moyens formant barrière (31), et en ce que ladite seconde partie formant jupe (47) comprend une rainure longitudinale (50; 50a) susceptible de recevoir ladite saillie (27) lorsque ledit capuchon d'aiguille (46) est tourné dans une position dans laquelle la saillie est alignée par rapport à la rainure (50; 50a).

2. Le corps de seringue et d'aiguille hypodermique selon la revendication 1, dans lesquels ladite partie formant jupe intérieure (52) est d'une forme sensiblement circulaire en coupe transversale.

3. Le corps de seringue et d'aiguille hypodermique selon la revendication 1 ou 2, dans lesquels ladite partie formant jupe extérieure (47) est de forme sensiblement circulaire en coupe transversale.

4. Le corps de seringue et d'aiguille hypodermique selon l'une quelconque des revendications 1 à 3, dans lesquels ladite saillie (27) est une ailette planaire s'étendant radialement vers l'extérieur à partir de la partie formant embout (23), ladite ailette étant sensiblement parallèle à l'axe longitudinal de ladite partie formant embout.

5. Le corps de seringue et d'aiguille hypodermique selon l'une quelconque des revendications 1 à 4, dans lesquels ladite partie formant embout (23) comprend une seconde saillie (28) disposée à l'opposé par rapport à ladite saillie (27).

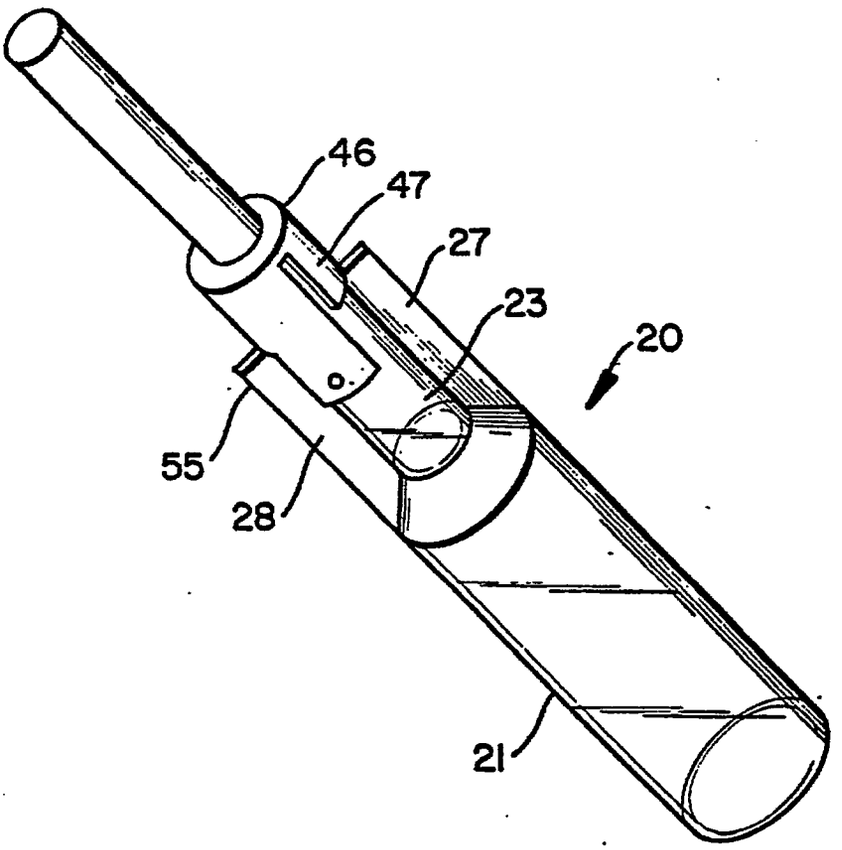


Fig. 1

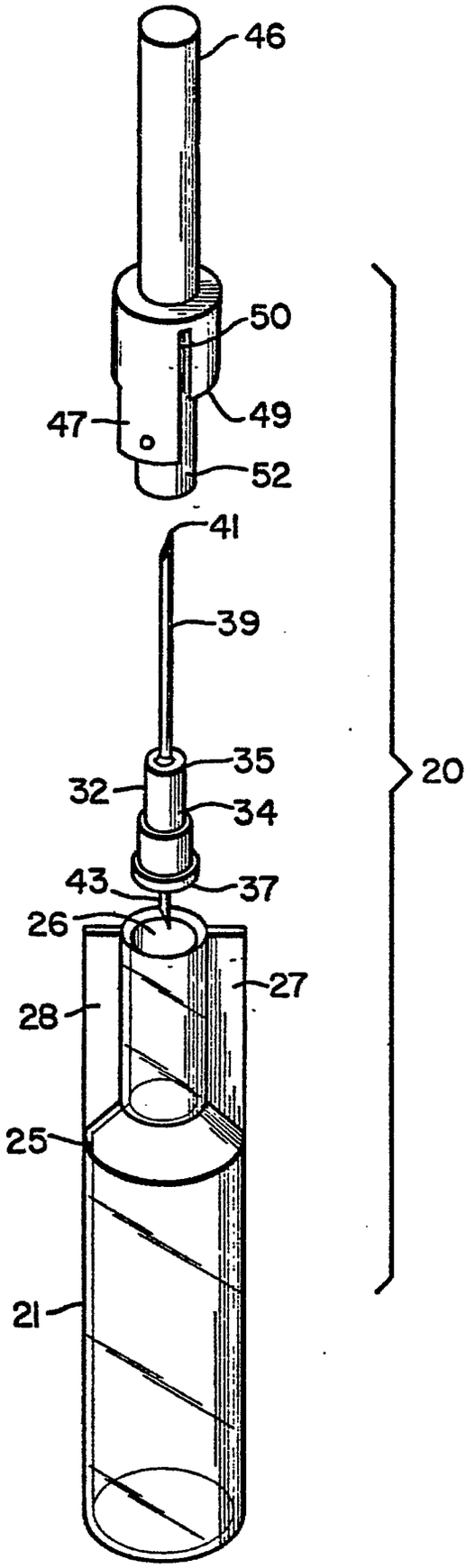


Fig. 2

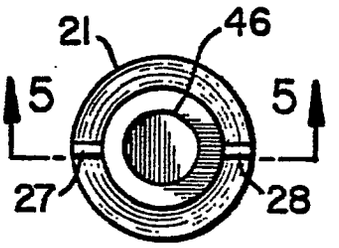


Fig. 3

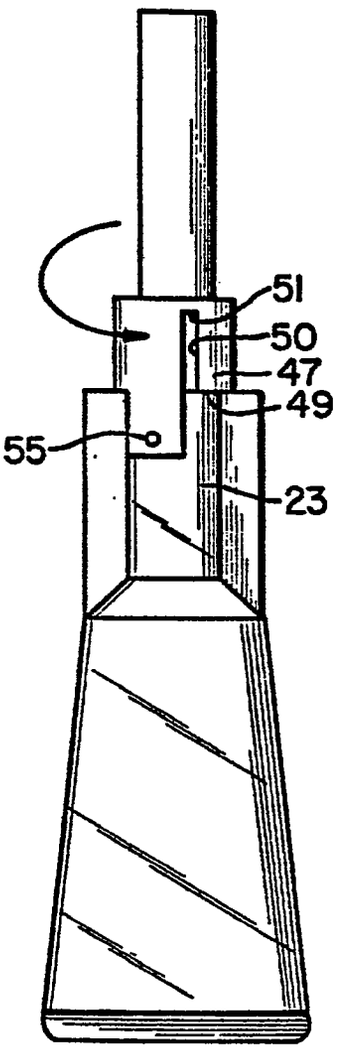


Fig. 4

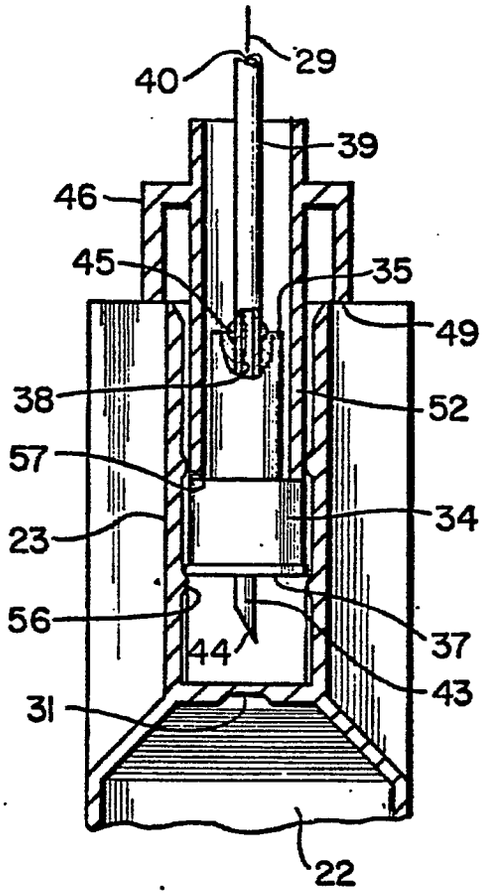


Fig. 5

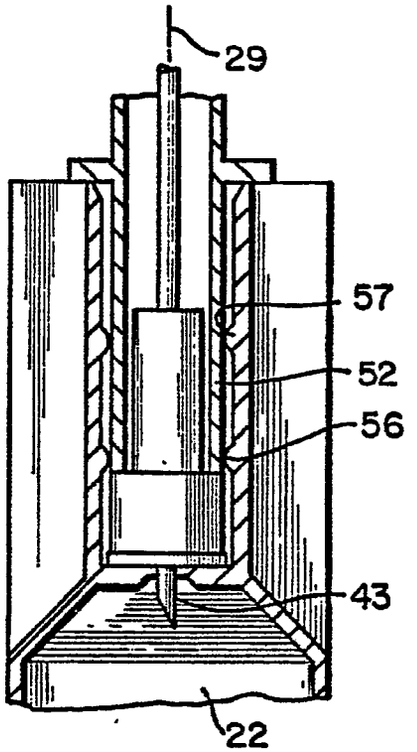


Fig. 6

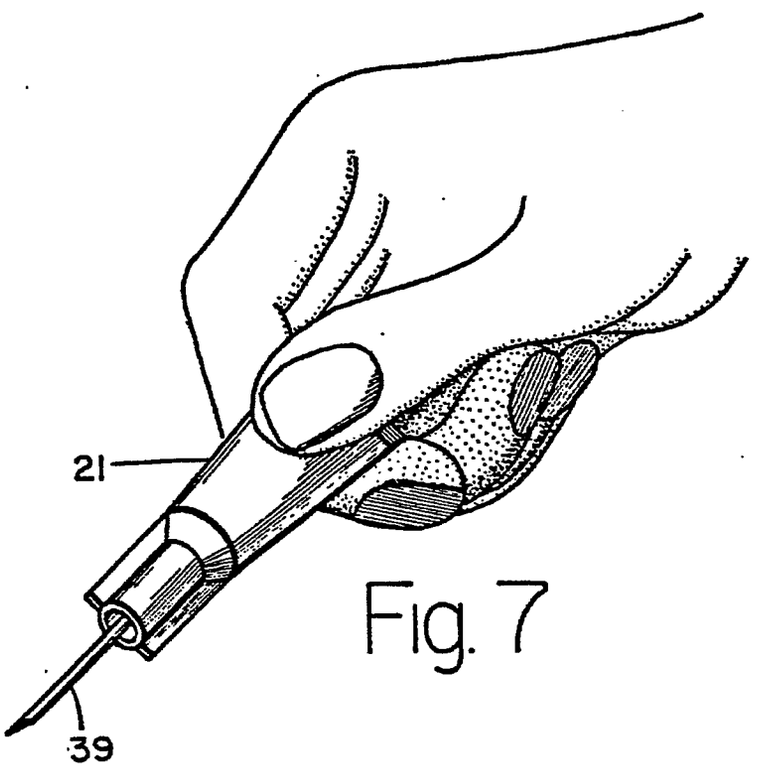


Fig. 7

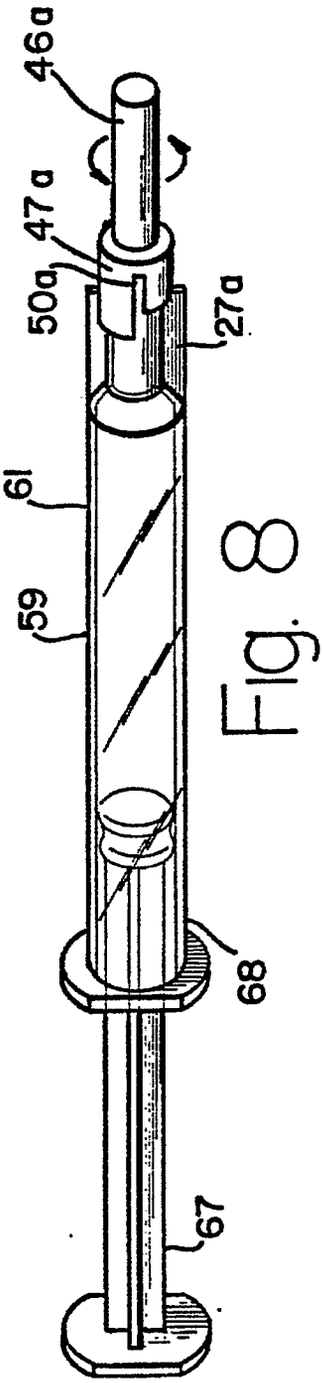


Fig. 8

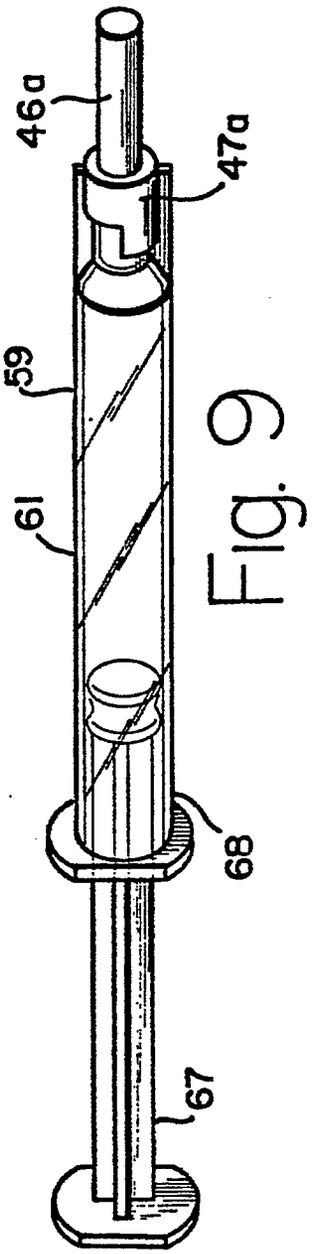


Fig. 9

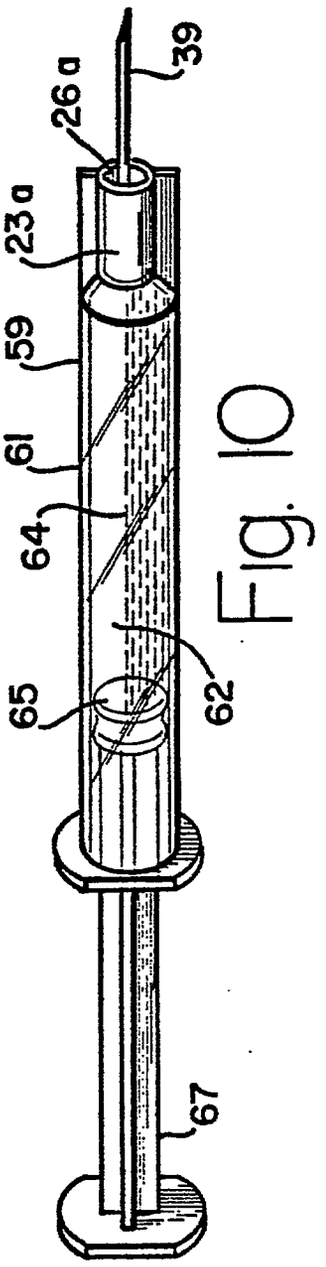


Fig. 10

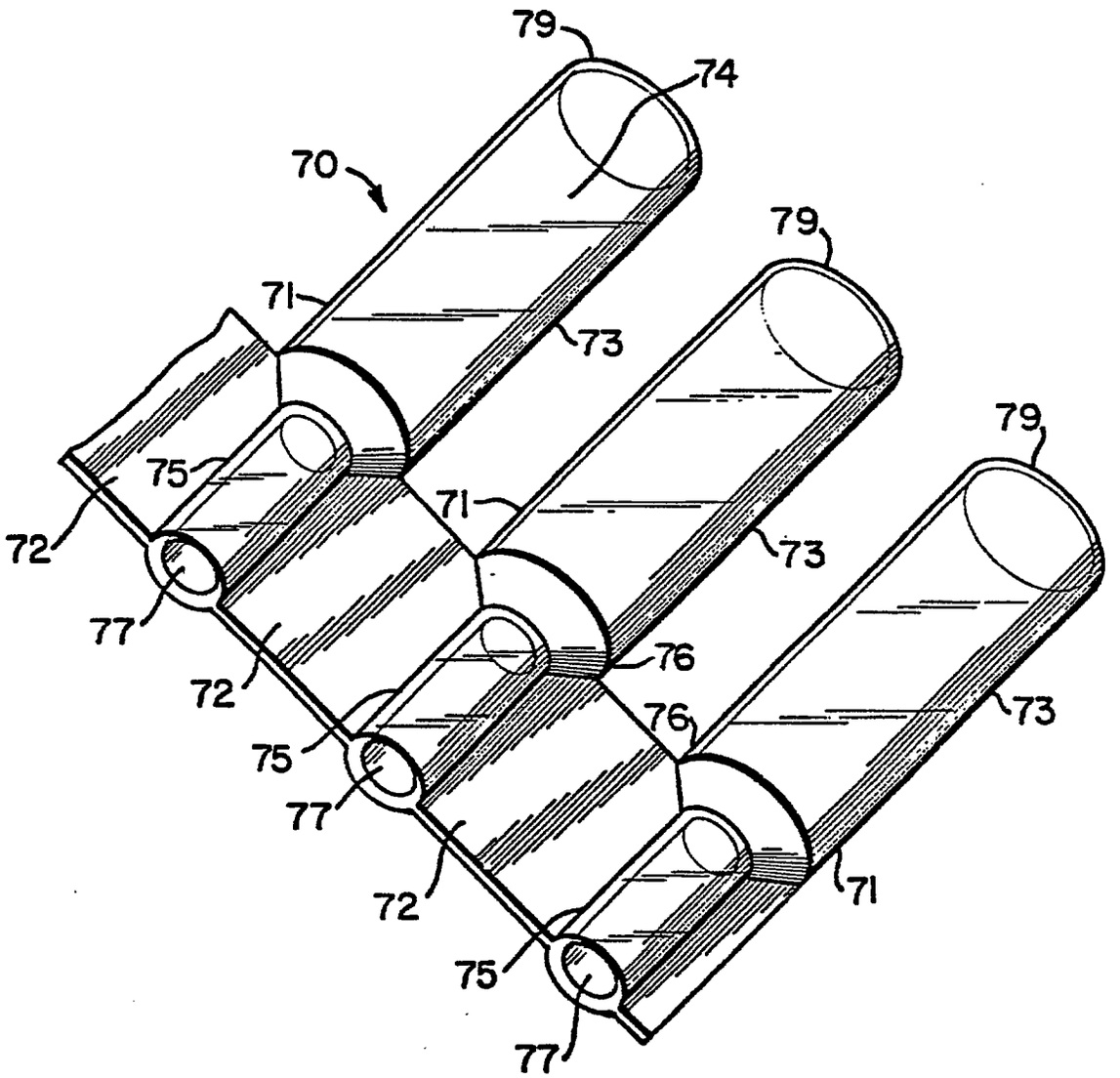


Fig. 11

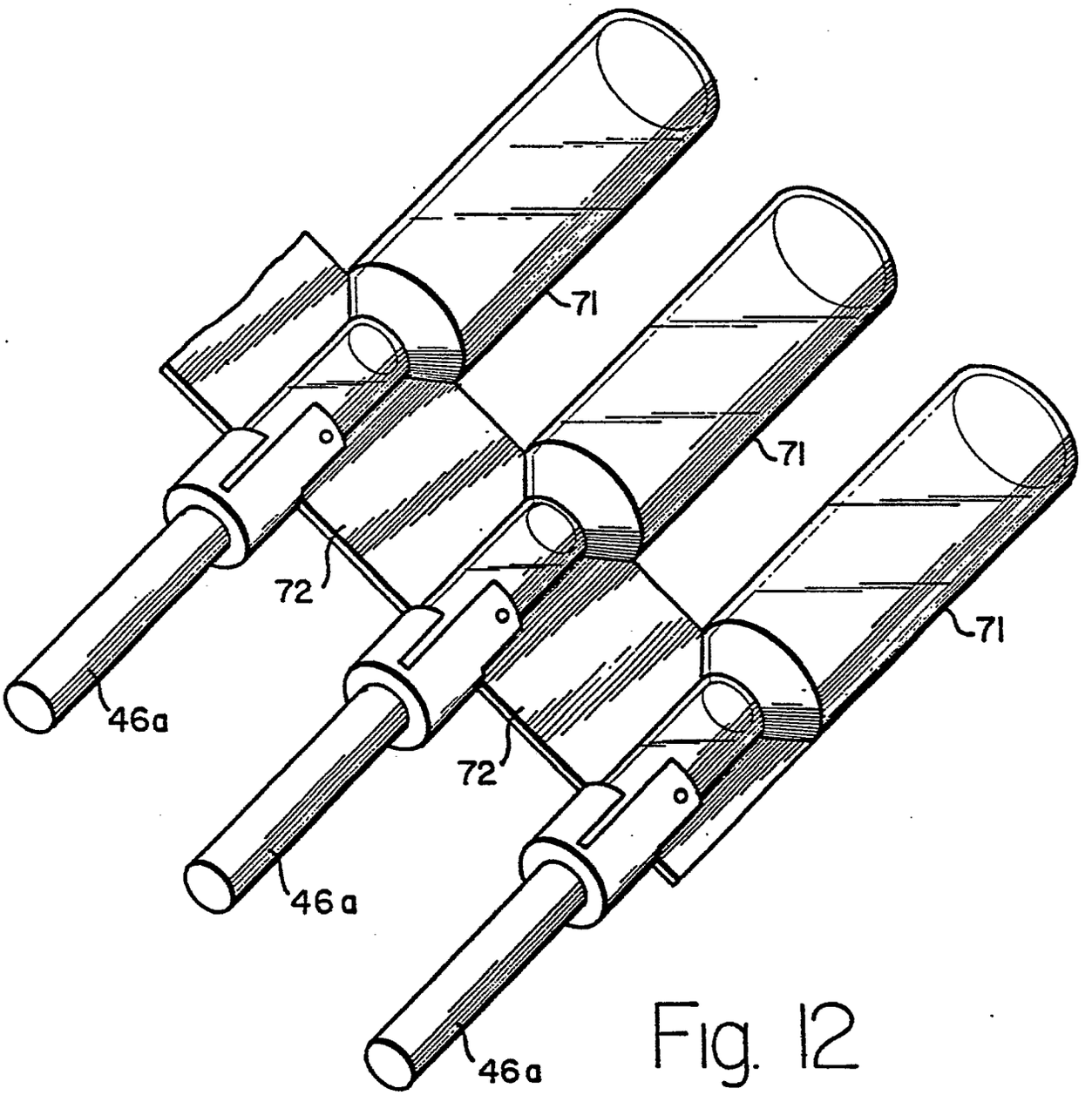


Fig. 12

Fig. 14

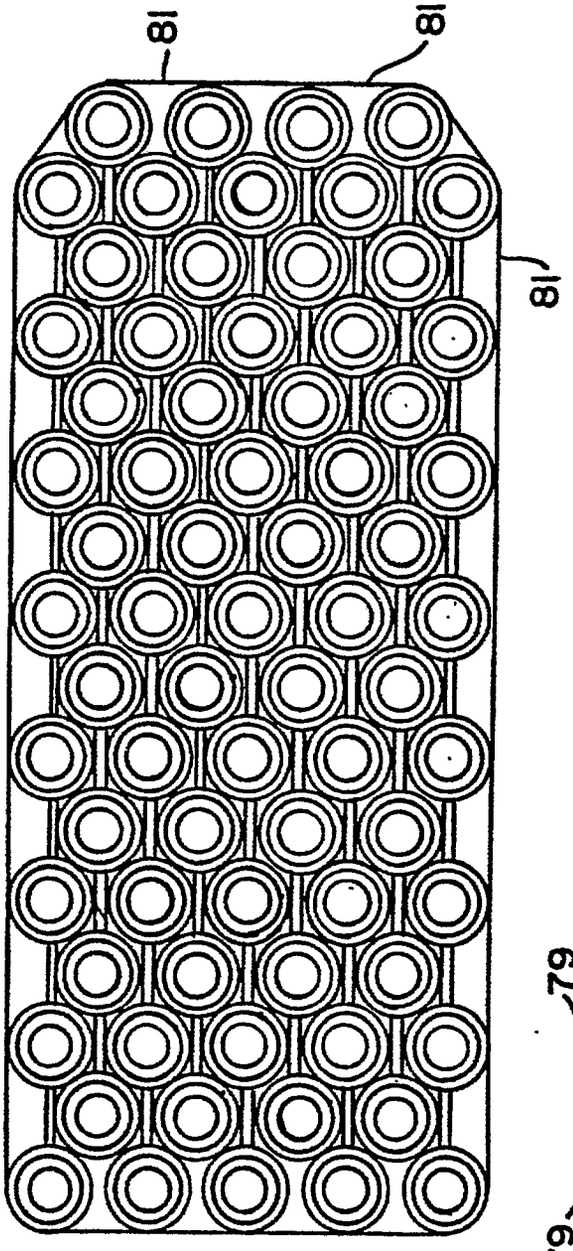
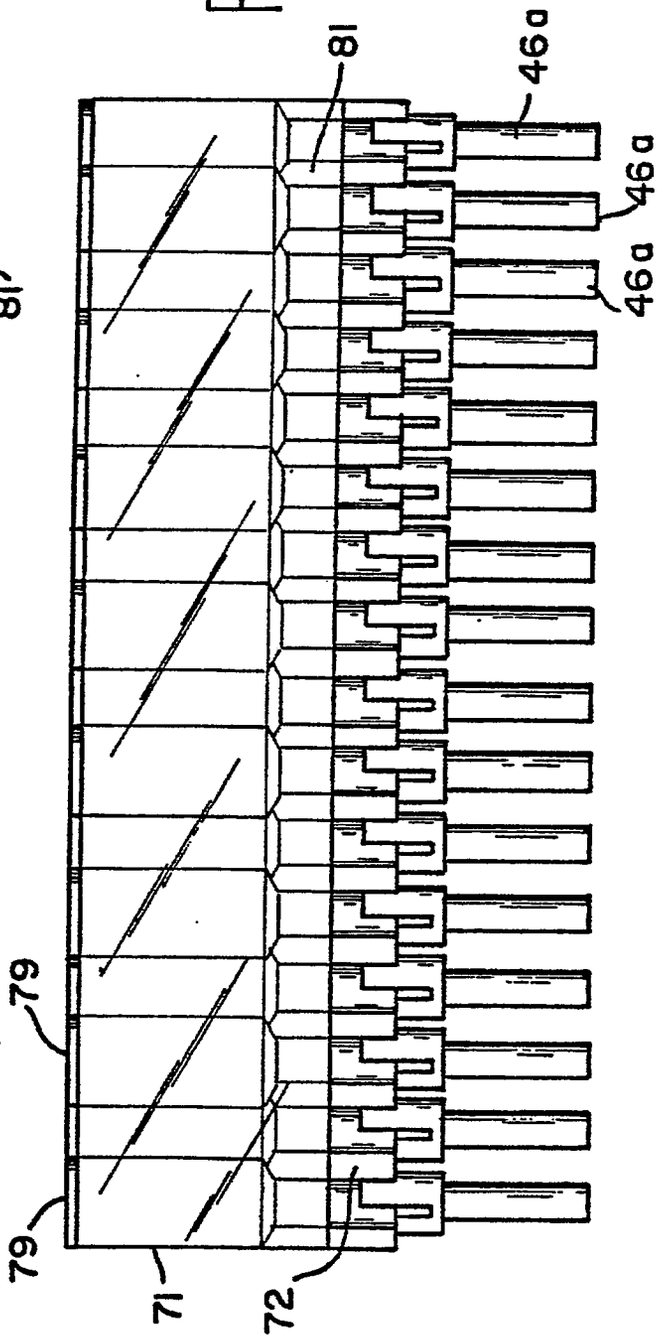


Fig. 13



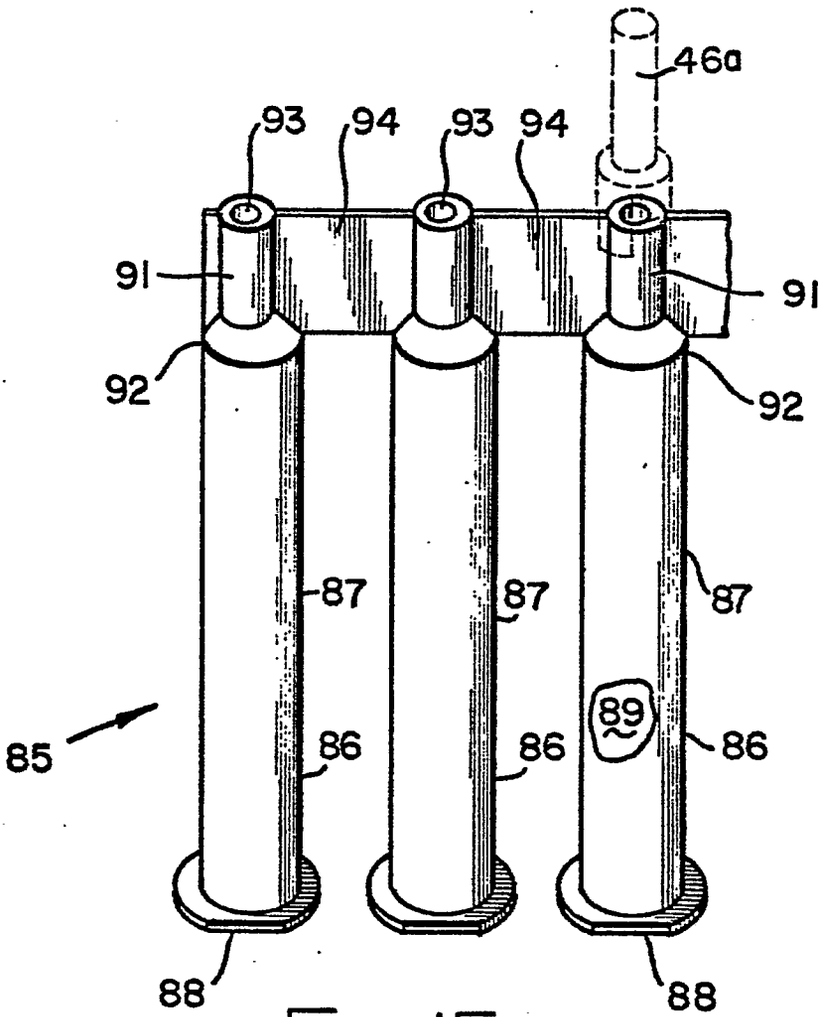


Fig. 15